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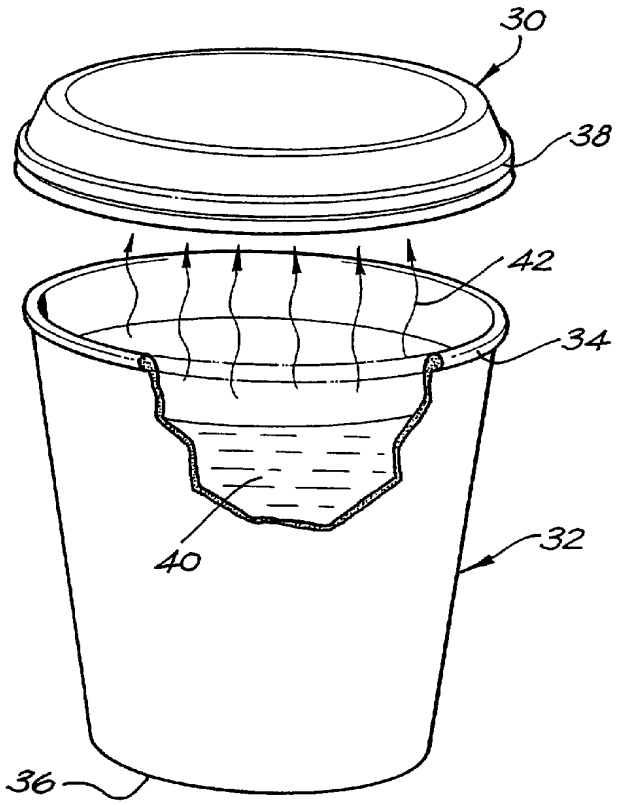

(57) Abstract: A lid (30) for a disposable beverage container (32). The lid (30) including at least a region having thermochromic properties which is/are adapted to change colour upon reaching a predetermined non-ambient temperature in response to heat transfer from or to contents (40) of the container (32). Also disclosed is a lid (60) including at least one recess (62) having an internal side wall or walls (64) that substantially correspond in size and sharpe to the external side wall(s) (66) of a container (68). The lid internal side walls (64) being adapted to securely frictionally engage, over substantially their entire surface area, the external side wall(s) (66) of another like container (68).

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A LID FOR A DISPOSABLE BEVERAGE CONTAINER

Field of the Invention

The present invention relates to a lid for a disposable beverage container.

The lid has been developed primarily for use with foam or paper cups commonly used in the sale of heated beverages, such as coffee, or chilled beverages, such as soft drinks, and will be described with reference to the former application. However, it will be appreciated that the invention is not limited to this particular use.

Background of the Invention

Numerous beverage lids and associated containers are known.

Some known lids include small printed or embossed warning signs of HOT or the like. However, a disadvantage of known lids and containers is they do not provide an estimated indication of the actual temperature of the contents of the container, particularly to those not handling the container. Such an estimated indication is desirable for many reasons as will be explained below. An example of two such reasons is improved safety when conveying heated container contents and improved quality control for customers expecting contents of a predetermined temperature.

Lids having recessed outer surfaces for receiving the underside of containers for stacking are also known. However, a disadvantage of such known lids and containers is they do not provide a secure engagement between the lid and container, sufficient to provide safe conveyance of stacked containers with lids.

Object of the Invention

It is an object of the present invention to substantially overcome or at least ameliorate one or more of the above disadvantages.

Summary of the Invention

Accordingly, in a first aspect, the present invention provides a lid for a disposable beverage container, the lid including at least a region having thermochromic properties which is/are adapted to change colour upon reaching a predetermined non-ambient temperature in response to heat transfer from or to contents of the container.

In one form, the region is substantially all of the lid. In another form, the lid includes a skirt adapted to substantially sealingly engage an open end of the container and the region is the skirt.

The region preferably changes from a first colour to second colour, of brighter or warmer tones than the first colour, when the contents are at the predetermined non-ambient temperature.

In an embodiment, the region changes from to a bright red colour when the contents are at a predetermined heated non-ambient temperature. The region is preferably violet when the contents are below the predetermined heated non-ambient temperature. The predetermined heated non-ambient temperature is preferably about 45 Degrees Celsius.

In another embodiment, the region changes colour to a blue colour to indicate the contents are at a predetermined chilled non-ambient temperature. The region is preferably violet when the contents are above the predetermined chilled non-ambient temperature. The predetermined chilled non-ambient temperature is preferably about 5 Degrees Celsius.

The lid is desirably formed from a plastics material in which the region(s) are impregnated or blended with a material having thermotropic properties. The material having thermochromic properties is desirably a thermochromic pigment, resin or the like, most desirably CHROMICOLOR (Trade Mark).

The region(s) form preferably words, symbols or patterns against the remainder of the lid when the contents are at the predetermined non-ambient temperature.

The region(s) are preferably adapted to return to their original colour in response to the temperature of the regions falling below the predetermined non-ambient temperature when that temperature is above ambient or rising above the predetermined non-ambient temperature when that temperature is below ambient.

In another form, the lid includes at least two regions having differing thermochromic properties which are each adapted to change to different colours upon reaching differing non-ambient temperatures in response to heat transfer from or to the contents of the container.

The lid is preferably formed from a co-extruded outer and inner layer and the region(s) having thermochromic properties is/are only in the outer layer.

In a second aspect, the present invention provides a lid for a disposable beverage container, the container having an open end and a closed end defined by external side wall or walls, the lid including at least one recess having an internal side wall or walls that substantially correspond to the container external side wall(s) in size and shape, wherein the lid internal side walls are adapted to securely frictionally engage, over substantially their entire surface area, the external side wall(s) of another like container.

The lid internal side wall(s) preferably engage the external side wall(s) of said another like container over approximately 5 to 15% of the height of said another like container. More preferably, the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 10% of the height of said another like container.

The lid internal side wall(s) preferably engage the external side wall(s) of said another like container over approximately 5 to 15 mm of the height of said another like container. More preferably, the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 10 mm of the height of said another like container.

In an embodiment, the lid includes two recesses each having said internal side wall(s), one of the recesses adapted to frictionally engage the closed end of another like container and the other of the recesses adapted to frictionally engage the closed end of another container of smaller or larger size than a like container. In this embodiment, the recess adjacent the container open end is smaller than the recess remote the container open end.

The lid internal side wall(s) of each recess preferably engage the external side wall(s) of said another like container over approximately 2.5 to 7.5% of the height of said another like container. More preferably, the lid internal side wall(s) of each recess engage the external side wall(s) of said another like container over approximately 5% of the height of said another like container.

The lid internal side wall(s) preferably engage the external side wall(s) of said another like container over approximately 2.5 to 7.5 mm of the height of said another like container. More preferably, the lid internal side wall(s) of each recess engage the external side wall(s) of said another like container over approximately 5 mm of the height of said another like container.

The recess(es) is/are desirably substantially cylindrical.

The recess(es) is/are desirably slightly outwardly conical.

The recess(es) desirably each include a flat surface adjacent one end of the side wall(s) adapted to, in use, abut the underside of said another like container closed end.

Brief Description of the Drawings

Preferred embodiments of the invention will now be described, by way of examples only, with reference to the accompanying drawings in which:

Fig. 1 is a side view of the lid according to a first embodiment of the invention and a correspondingly sized container;

Fig. 2 is a first perspective view of the lid and container shown in Fig. 1;

Fig. 3 is a second perspective view of the lid and container shown in Fig. 1;

Fig. 4 is a perspective view of a lid according to a second embodiment of the invention and a correspondingly sized container;

Fig. 5 is perspective view of a lid according to a third embodiment of the invention and a correspondingly sized container;

Fig. 6 is a side view of the lid according to a fourth embodiment of the invention and a correspondingly sized container;

Fig. 7 is a second side view of the lid and container shown in Fig. 6;

Fig. 8 is a third side view of the lid and container shown in Fig. 6;

Fig. 9 is a fourth side view of the lid and container shown in Fig. 6;

Fig. 10 is a perspective view of a lid according to a fifth embodiment of the invention;

Fig. 11 is a cross sectional side view of the lid shown in Fig. 10;

Fig. 12 is a perspective view of the lid according to a sixth embodiment of the invention;

Fig. 13 is a cross sectional side view of the lid shown in Fig. 12;

Fig. 14 is a perspective view of the lid according to a seventh embodiment of the invention;

Fig. 15 is a perspective view of the lid according to an eighth embodiment of the invention;

Fig. 16 is a perspective view of the lid according to a ninth embodiment of the invention;

Fig. 17 is a cross sectional side view of the lid shown in Fig 15; and

Fig. 18 is a cross sectional side view of the lid according to an tenth embodiment of the invention.

Detailed Description of the Preferred Embodiments

Referring firstly to Figures 1 to 3, there is shown a lid 30 according to a first embodiment of the invention. The lid 30 is for use with a disposable beverage container, in the form of polystyrene cup 32, as are commonly used in the sale of coffee. The cup 32 includes an open end surrounded by a circular rim 34 and a closed end defined by a

circular flat base 36. The lid 30 includes a peripheral skirt 38 adapted to substantially sealingly engage with the rim 34 of the cup 32, as is well known in the art.

The construction and external shape of the lid 30 is substantially identical to known commercially available high impact polystyrene (HIPS) lids, except the lid 30 also includes therein a material having thermochromic properties, preferably thermochromic pigment, as will be explained in more detail below. Materials having thermochromic properties, including but not limited to thermochromic pigments, are also known. Briefly, materials having thermochromic properties change colour (hereinafter referred to as a thermochromic activation colour) upon reaching a predetermined temperature (hereinafter referred to as a thermochromic activation temperature). The colour is usually gradual from near the activation temperature and complete by the activation temperature. For example a thermochromic pigment with an activation temperature of 45 Degrees Celcius would begin changing to the thermochromic activation colour at about 45 Degrees Celcius, with the colour charge being complete by 45 Degrees Celcius.

In use, the cup 32 is filled with contents 40 which, in the present embodiment, would be hot coffee. After the cup 32 has been filled with the hot contents 40, the lid 30 is applied in the known manner to seal the open end of the cup 32 about the rim 34. Heat transfer then occurs between the heated contents 40 and the (ambient temperature) lid 30, as generally indicated by arrows 42. When the heat transfer is sufficient to heat the lid 30 from ambient temperature to a predetermined thermochromic activation temperature of the thermochromic pigment within the lid 30, the thermochromic properties of the pigment cause the lid 30 to change colour, as indicated by the shaded portions of the lid shown in Figure 3. As an example, when the lid 30 is used with cups of hot coffee, a thermochromic pigment is chosen with a thermochromic activation temperature of 45 Degrees Celsius and an thermochromic activation colour of bright red. The

When used with heated beverages, as described in relation to Figs. 1 to 3, the lid 30 preferably presents a violet or similar colour when at ambient temperature and a bright red colour when heated to the thermochromic activation temperature, which provides an intuitive indication that the contents of the cup 32 are hot.

When the contents 40, and thus the lid 30, have cooled to below the thermochromic activation temperature, the lid 30 returns to its original colour to indicate that the contents 40 have cooled.

When the cup 32 is to be used with chilled beverages, a thermochromic pigment is selected with a thermochromic activation temperature of, for example, 5 Degrees Celsius and an activation colour of blue. When the lid 30 has been chilled to 5 Degrees

Celsius due to heat transfer from the (ambient temperature) lid 30 to the chilled contents 40, the lid 30 turns a blue colour to indicate that the contents are at the predetermined chilled temperature. Again, when the contents 40, and thus the lid 30, warm to above the thermochromic activation temperature, the lid 30 returns to its original violet colour to indicate the contents 40 are no longer chilled.

Fig. 4 shows a lid 44 according to the second embodiment of the invention and like reference numerals to those used in describing the first embodiment will be used to denote like features. The lid 44 is similar to the lid 32 according to the first embodiment except it includes an opening 45a to allow a user to consume the contents 40 without removing the lid 44 from the cup 32 and an area 45b without thermochromic properties to allow advertising, consumer or other information or indicia to be applied to the lid 44.

Fig. 5 shows a lid 46 according to a third embodiment of the invention and like reference numerals to those used in describing the first and second embodiments will be used to denote like features. The lid 46 is also similar to the lid 30 according to the first embodiment of the invention except different regions of the lid have been produced using thermochromic pigments of differing activating temperatures so that different parts of the lid, for example rim 48, lid side wall 50 and top 52 can each be configured to change colour at differing temperatures (eg. 40, 45 and 50 Degrees Celsius respectively), to provide a progressive indication of temperature.

Figs. 6 to 9 show a lid 54 according to a fourth embodiment of the invention and like reference numerals to those used in describing the previous embodiments will be used to denote like features. The lid 54 is similar to the lid 30 according to the first embodiment of the invention except it has a slightly more raised top surface 56. Importantly, the lid 54 includes the skirt 38 which is adapted to substantially sealingly engage with the rim 34 of the cup 32.

As with earlier embodiments, the shaded portion of the lid 54 shown in Fig. 7 demonstrates that the thermochromic pigment in the lid 54 causes it to change colour when heat transfer from the contents 40 of the cup 32 cause the lid 54 to reach a predetermined thermochromic activation temperature.

Fig. 8 shows the lid 54 and the cup 32 when the lid 54 has been correctly applied to the cup 32 and the skirt 38 covers, and is engaged with, the rim 34 of the cup 32 about its entire periphery. In this position, the rim 34 effectively insulates the skirt 38 from heat transfer with the contents 40 of the cup 32. Accordingly, as shown, only parts 58 of the lid 54 other than the skirt 38 change colour upon reaching the predetermined thermochromic activation temperature. However, as shown in Fig. 9, if the skirt 38 is not

completely sealed with respect to the rim 34 then hot vapours or similar can pass through the gap between the unsealed portion of the skirt 38 and the rim 34, causing heat transfer and an associated colour change in the unsealed portion 38a of the skirt 38. Accordingly, applying thermochromic material to all of the lid 54 including the skirt 38, or only the skirt 38, can be used to provide a visual indication as to whether or not the lid 54 is properly sealed with respect to the cup 32, as can occur due to operator error, for avoidance of spillage and the like.

The lid embodiments described above are preferably all moulded, particularly vacuum moulded, with thermochromic pigments introduced to the molten plastics material (HIPS) before moulding. The preferred method of producing the thermochromic regions of the lids involve co-extruding two layers of HIPS. The inner layer (ie. that adjacent the contents of the cup in use) of HIPS is produced conventionally and with a base pigment of either white or a grey tone to add a depth of colour to the lid. The outer layer (ie. that remote the contents of the cup in use) is produced from a clear HIPS to which has been added approximately 7 to 20, preferably 10, percent by weight of a thermochromic pigment and 2 to 3 percent of a standard pigment of a similar colour to the activated colour of the thermochromic pigment. The thermochromic pigments themselves are commercially available from several sources including, for example, those denoted F4, G7 or J8 and sold under the trademark CHROMICOLOR by Matsui International Co. Inc. of Gardena, CA, United States of America.

The advantages of the lids according to the embodiments described above are many. For example, the lids can be used in the case of hot beverages to include a warning to the individual with the container, and those they may be approaching, that there are hot and potentially hazardous contents contained therein. In the case of chilled contents, the previously described embodiments of lids provide an indication that the contents have been chilled to a temperature expected by the consumer.

The lids also provide an improved indication of temperature to individuals with reduced eyesight, numbness of the fingers or those who handle containers in darkened environments.

Figs. 10 and 11 show a lid 60 according to a fifth embodiment of the invention. The lid 60 includes a recess 61 having a substantially cylindrical slightwardly outwardly conical internal side wall 63 around a flat surface 64. The lid 60 also includes a vent hole 65, as is well known in the art.

As best shown in Fig. 11, the internal side wall 63 substantially corresponds in size and shape to the external side wall 66 that define the closed end of an associated

container, such as cup 68. Accordingly, when the closed end of the container 68 is positioned within the recess 61 of the lid 60, the lid internal side wall 63 securely frictionally engages, over substantially its entire surface area, the external side wall 66 of the container 68. More particularly, in relation to a standard volume 8 Ounce (237mls) coffee cup, the side walls 64 and 66 engage over approximately 10 mm (10 percent) of the height of the container.

Figs. 12 and 13 show a lid 70 according to a sixth embodiment of the invention and like reference numerals to those used in describing the fifth embodiment will be used to denote like features. The lid 70 is similar to the lid 60 according to the fifth embodiment except the internal side wall 63 does not extend around the entire lid periphery and instead has a portion removed to allow room for provision of a drinking spout 72.

Fig. 14 shows a lid 74 according to a seventh embodiment of the invention and like reference numerals to those used in describing the fifth and sixth embodiments will be used to denote like features. The lid 74 is substantially identical to the lid 60 according to the fifth embodiment except the recess 61 is deeper and provides a side wall 76 that engages with the external side walls of a corresponding container (not shown) over approximately 20 mm (10 percent) of the height of the container.

Fig. 15 and 17 show a lid 78 according to an eighth embodiment of the invention and like reference numerals to those used in describing the fifth to seventh embodiments will be used to denote like features. The lid 78 is substantially identical to the lid 74 of the seventh embodiment except it includes two recess 61a and 61b surrounded by respective side walls 63a and 63b. The recess 61a is, in use, adjacent the associated cup's open end and adapted to engage a smaller container compared to the recess 61b, which is remote the cup's open end and adapted to engage a relatively larger container. This allows the lid 78 to seal one of either a larger or smaller size cup and have another of the larger or smaller size cup engaged therewith by stacking (larger 32 cup shown).

Fig. 16 shows a lid 82 according to a ninth embodiment of the invention and like reference numerals to those used in describing the fifth to eighth embodiments will be used to denote like features. The lid 82 is substantially identical to the lid 78 of the eighth embodiment except it includes a drinking spout 84 and external depressions 84, which serve to increase the structural rigidity of the lid 82.

Fig. 18 shows a lid 90 according to an tenth embodiment of the invention and like reference numerals to those used in describing the fifth to ninth embodiments will be used to denote like features. The lid 90 is for use with a paper cup 94 is substantially

identical to the lid 86 of the ninth embodiment except the lower edges of the recesses 61a and 61b continue as grooves 92a and 92b respectively, which serve to receive and engage a peripheral edge 96 on the underside of the paper cup 94. The lid 90 is shown engaged with a smaller cup.

The main advantage of the lids according to the fifth to twelth embodiments of the invention is they provide a secure gripping engagement with the underside of a correspondingly sized container, such that when the lids are secured to a primary container they can be engaged with a secondary stacked container in a secure fashion to provide for ease of carrying multiple stacked containers.

Although the invention has been described with reference to specific examples, it will be appreciated to those skilled in the art that the invention may be embodied in many other forms. Particularly, the thermochromic features of the first five embodiments can be incorporated with the stacking features of the sixth to twelth embodiments and vice versa.

CLAIMS

1. A lid for a disposable beverage container, the lid including at least a region having thermochromic properties which is/are adapted to change colour upon reaching a predetermined non-ambient temperature in response to heat transfer from or to contents of the container.

2. A lid as claimed in claim 1, wherein the region is substantially all of the lid.

3. A lid as claimed in claim 1, wherein the lid includes a skirt adapted to substantially sealingly engage an open end of the container and the region is the skirt.

4. A lid as claimed in claim 1, 2 or 3, wherein the region changes from a first colour to second colour, of brighter or warmer tones than the first colour, when the contents are at the predetermined non-ambient temperature.

5. A lid as claimed in claim 1, 2 or 3, wherein the region changes to a bright red colour colour when the contents are at a predetermined heated non-ambient temperature.

6. A lid as claimed in claim 5, wherein the region is violet when the contents are below the predetermined heated non-ambient temperature.

7. A lid as claimed in claim 6, wherein the predetermined heated non-ambient temperature is about 45 Degrees Celsius.

8. A lid as claimed in claim 1, 2 or 3, wherein the region changes to a blue colour when the contents are at a predetermined chilled non-ambient temperature.

9. A lid as claimed in claim 9, wherein the region is violet when the contents are above the predetermined chilled non-ambient temperature.

10. A lid as claimed in claim 6, wherein the predetermined chilled non-ambient temperature is about 5 Degrees Celsius.

11. A lid as claimed in any one of the preceding claims, wherein the lid is formed from a plastics material in which the region(s) are impregnated or blended with a material having thermotropic properties.

12. A lid as claimed in claim 11, wherein the material having thermochromic properties is a thermochromic pigment, resin or the like.

13. A lid as claimed in claim 12, wherein the material having thermochromic properties is CHROMICOLOR (Trade Mark).

14. A lid as claimed in any one of the preceding claims, wherein the region(s) form words, symbols or patterns against the remainder of the lid when the contents are at the predetermined non-ambient temperature.

15. A lid as claimed in any one of the preceding claims, wherein the region(s) are adapted to return to their original colour in response to the temperature of the regions falling below the predetermined non-ambient temperature when that temperature is above ambient or rising above the predetermined non-ambient temperature when that temperature is below ambient.

16. A lid as claimed in any one of the preceding claims, the lid including at least two regions having differing thermochromic properties which are each adapted to change to different colours upon reaching differing non-ambient temperatures in response to heat transfer from or to the contents of the container.

17. A lid as claimed in any one of the preceding claims, wherein the lid is formed from a co-extruded outer and inner layer and the region(s) having thermochromic properties is/are only in the outer layer.

18. A lid for a disposable beverage container, the container having an open end and a closed end defined by external side wall or walls, the lid including at least one recess having an internal side wall or walls that substantially correspond to the container external side wall(s) in size and shape, wherein the lid internal side walls are adapted to securely frictionally engage, over substantially their entire surface area, the external side wall(s) of another like container.

19. A lid as claimed in claim 18, wherein the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 5 to 15% of the height of said another like container.

20. A lid as claimed in claim 19, wherein the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 10% of the height of said another like container.

21. Lid as claimed in claim 18, wherein the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 5 to 15 mm of the height of said another like container.

22. A lid as claimed in claim 21, wherein the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 10 mm of the height of said another like container.

23. A lid as claimed in claim 18, wherein the lid includes two recesses each having said internal side wall(s), one of the recesses adapted to frictionally engage the closed end of another like container and the other of the recesses adapted to frictionally engage the closed end of another container of smaller or larger size than a like container.

24. A lid as claimed in claim 19, wherein the recess adjacent the container open end is smaller than the recess remote the container open end.

25. A lid as claimed in claim 23, wherein the lid internal side wall(s) of each recess engage the external side wall(s) of said another like container over approximately 2.5 to 7.5% of the height of said another like container.

26. A lid as claimed in claim 25, wherein the lid internal side wall(s) of each recess engage the external side wall(s) of said another like container over approximately 5% of the height of said another like container.

27. Lid as claimed in claim 23, wherein the lid internal side wall(s) engage the external side wall(s) of said another like container over approximately 2.5 to 7.5 mm of the height of said another like container.

28. A lid as claimed in claim 27, wherein the lid internal side wall(s) of each recess engage the external side wall(s) of said another like container over approximately 5 mm of the height of said another like container.

29. A lid as claimed in any one of claims 18 to 28, wherein the recess(es) is/are substantially cylindrical.

30. A lid as claimed in any one of claims 18 to 29, wherein the recess(es) is/are slightly outwardly conical.

31. A lid as claimed in any one of claims 18 to 30, wherein the recess(es) each include a flat surface adjacent one end of the side wall(s) adapted to, in use, abut the underside of said another like container closed end.

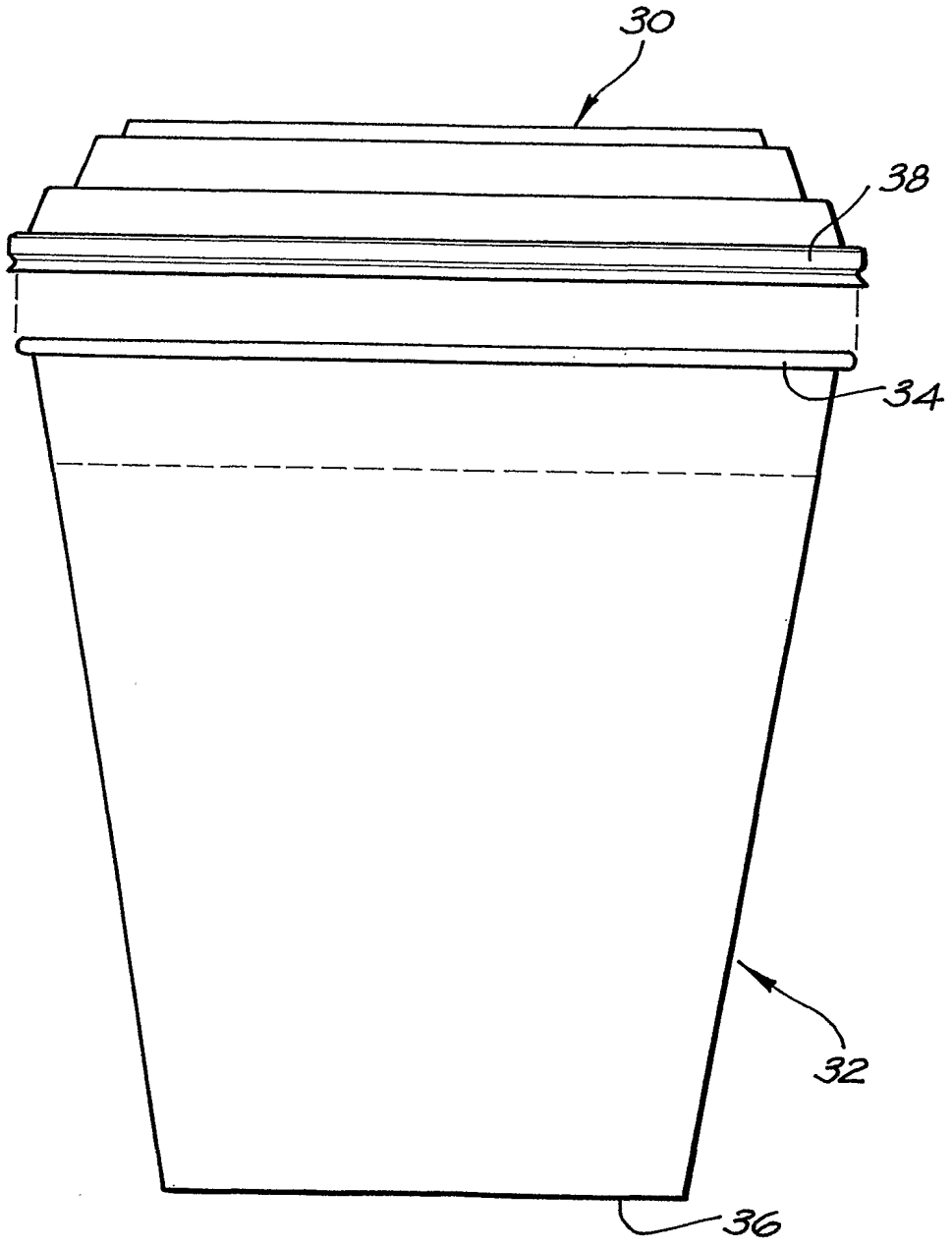

FIG. 1

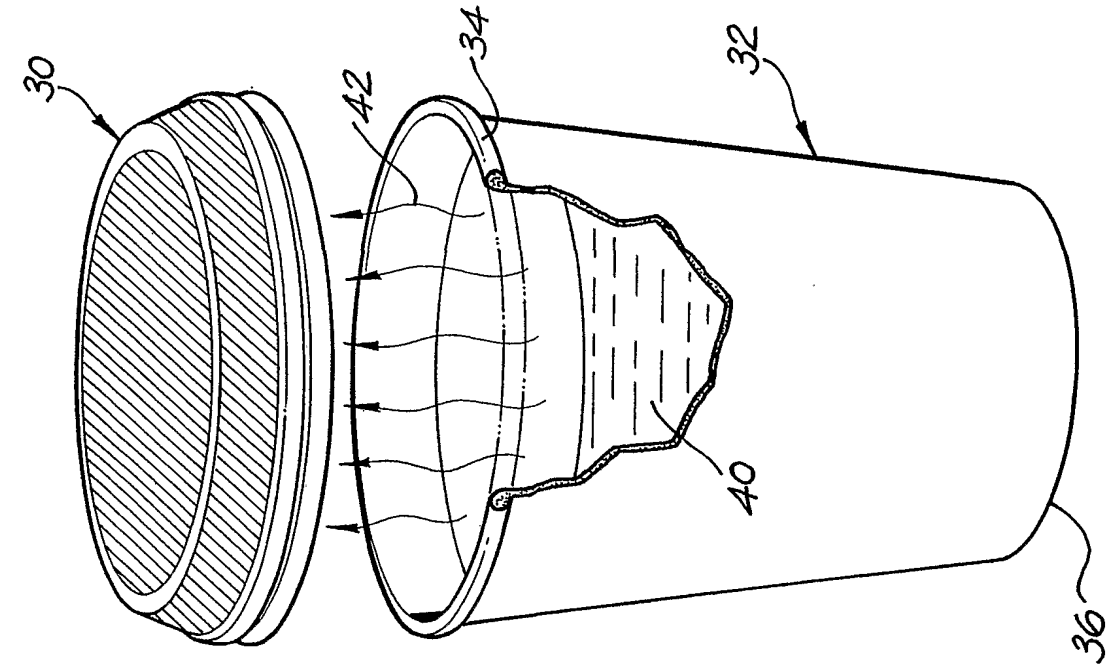

FIG. 3

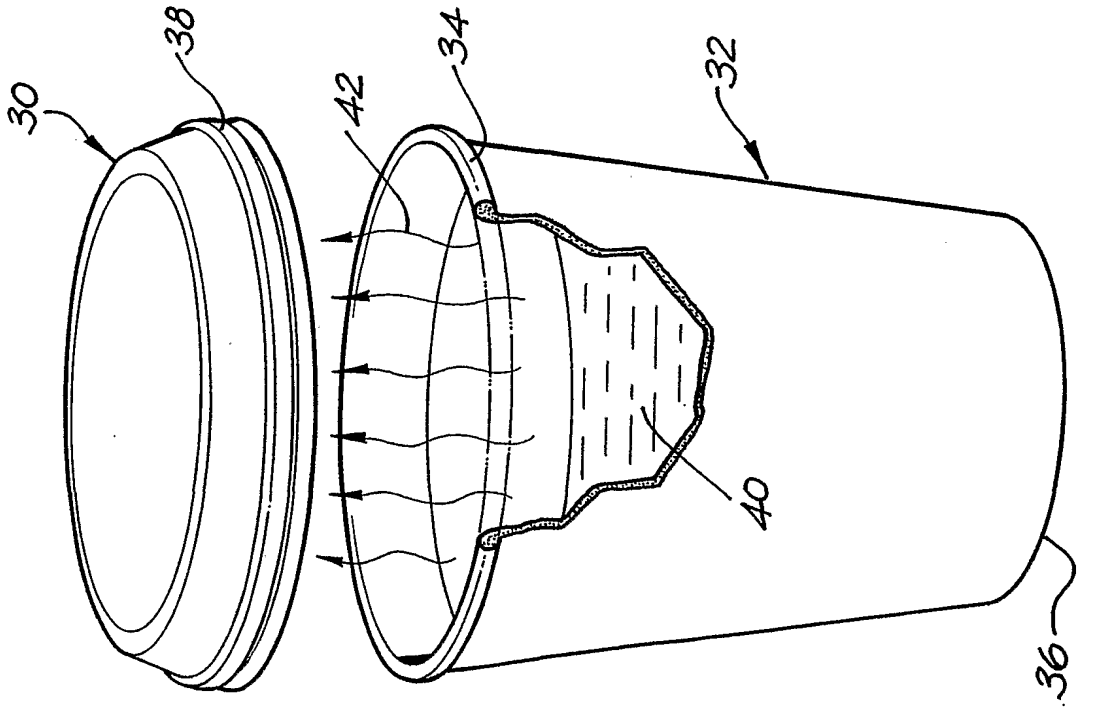

FIG. 2

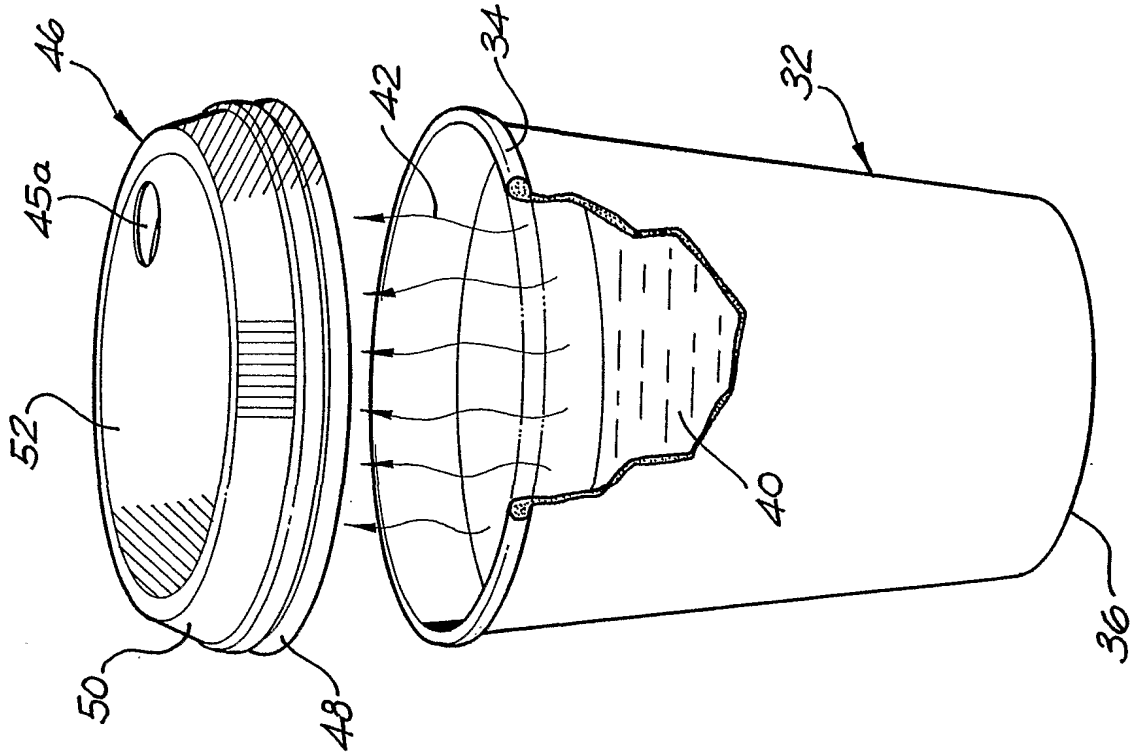

FIG. 5

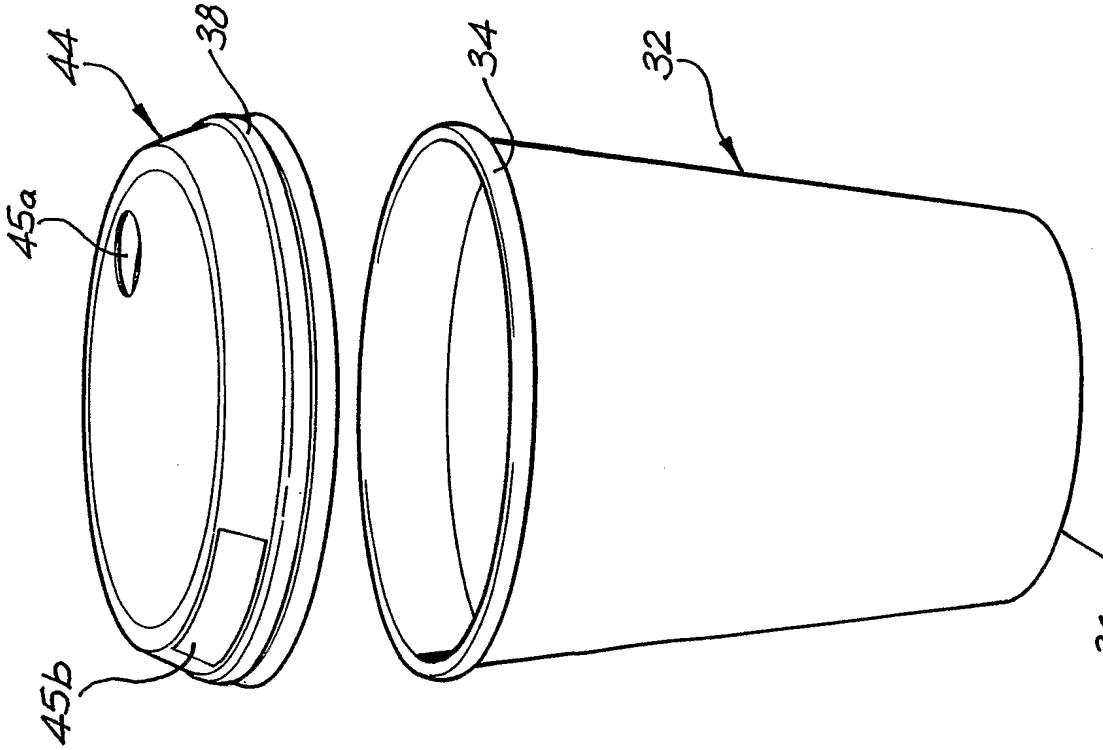

FIG. 4

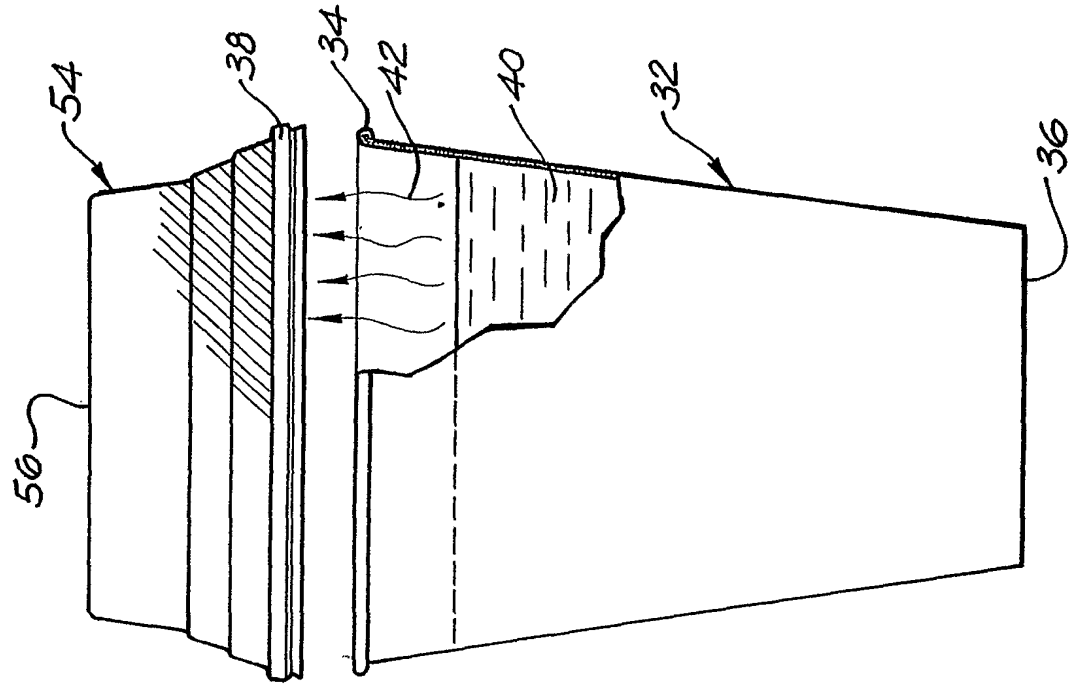

FIG. 7

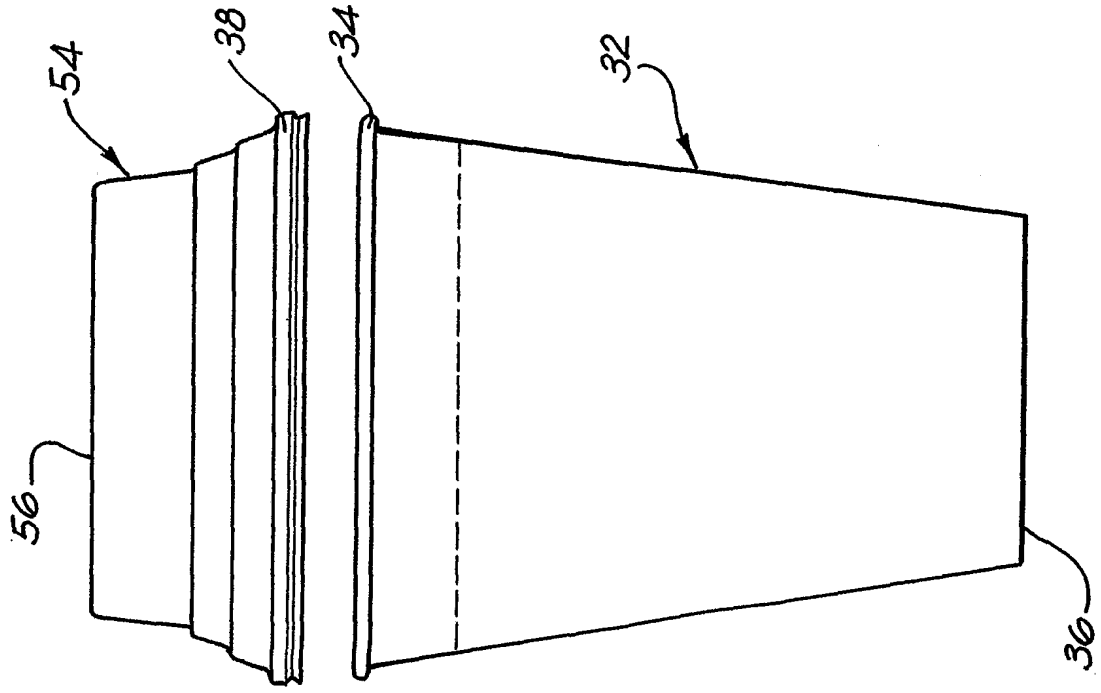

FIG. 6

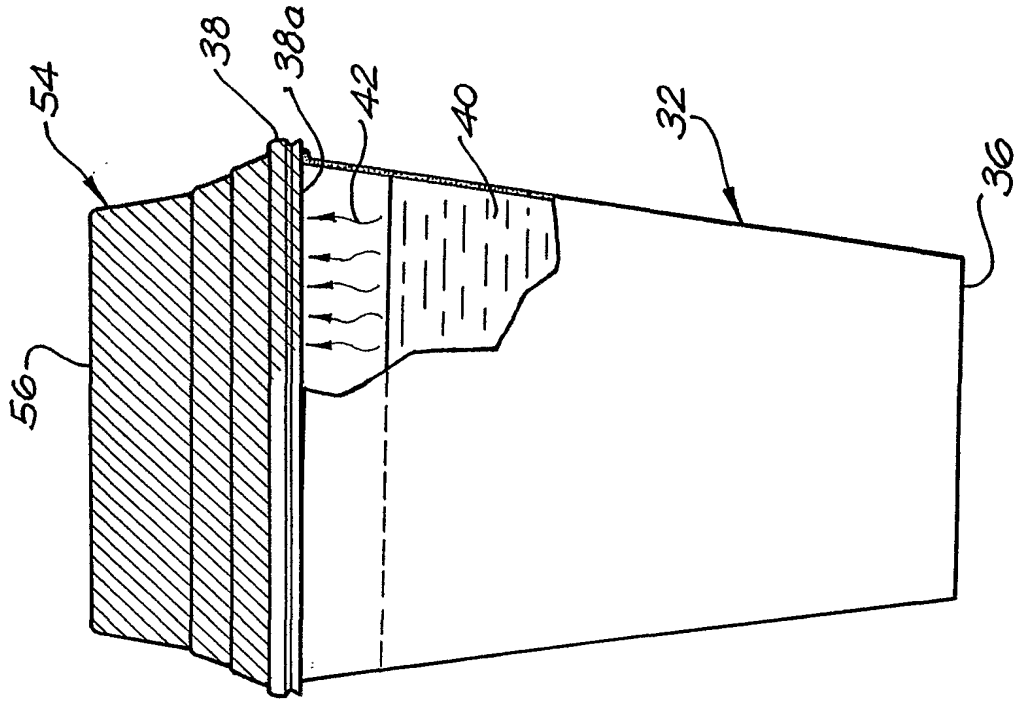

FIG. 9

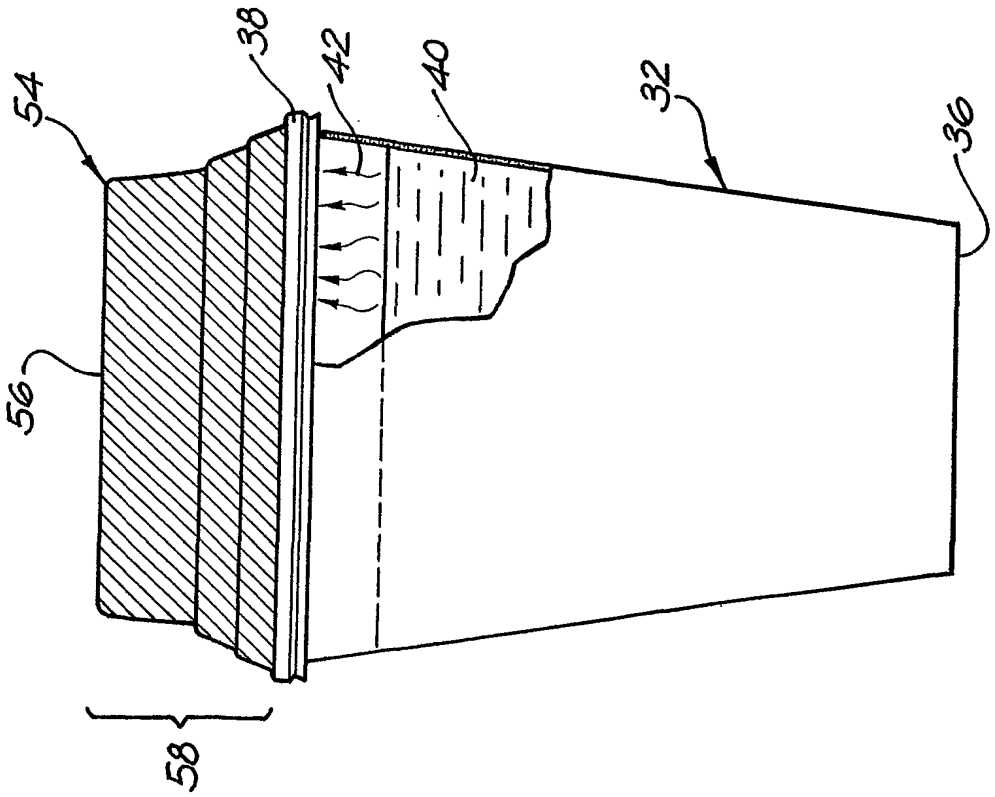

FIG. 8

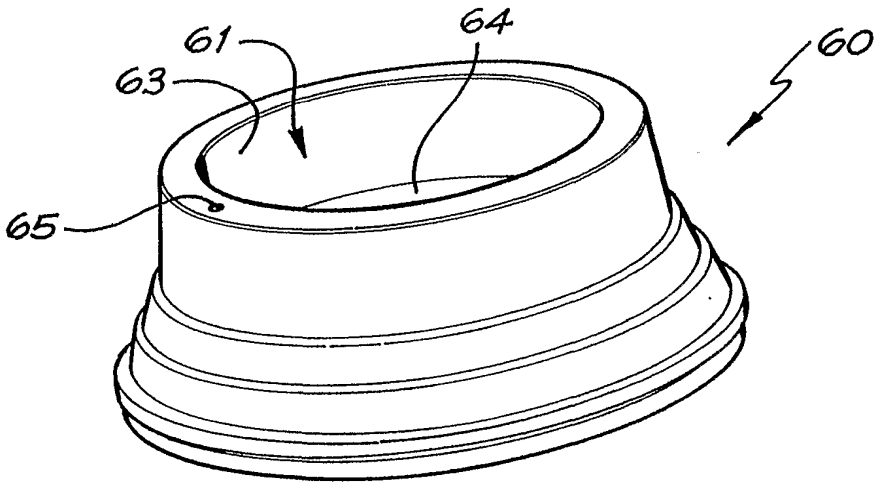

FIG. 10

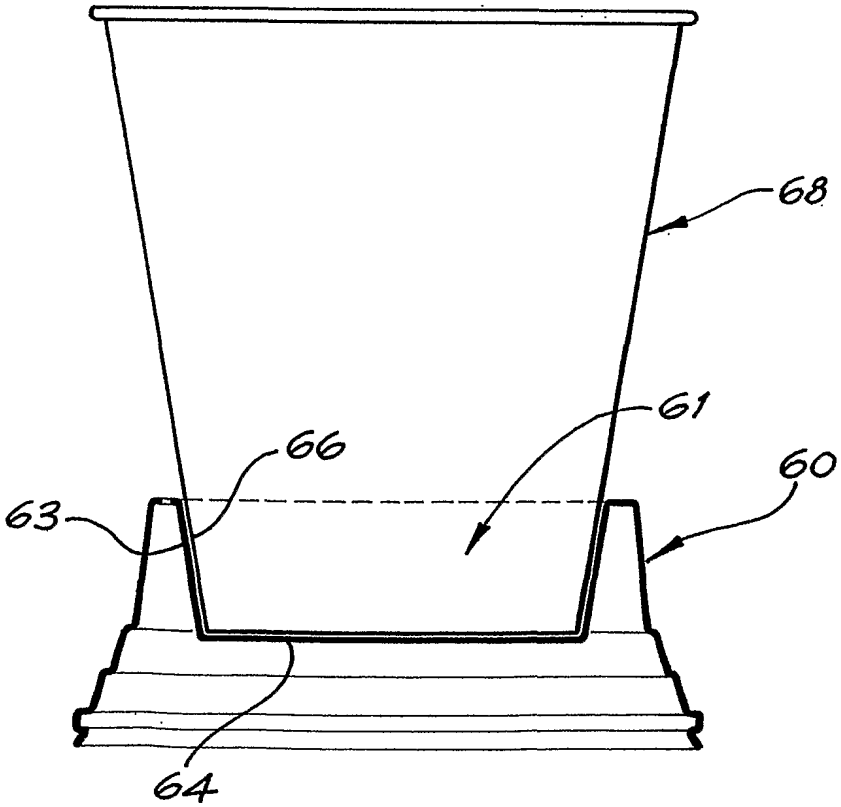

FIG. 11

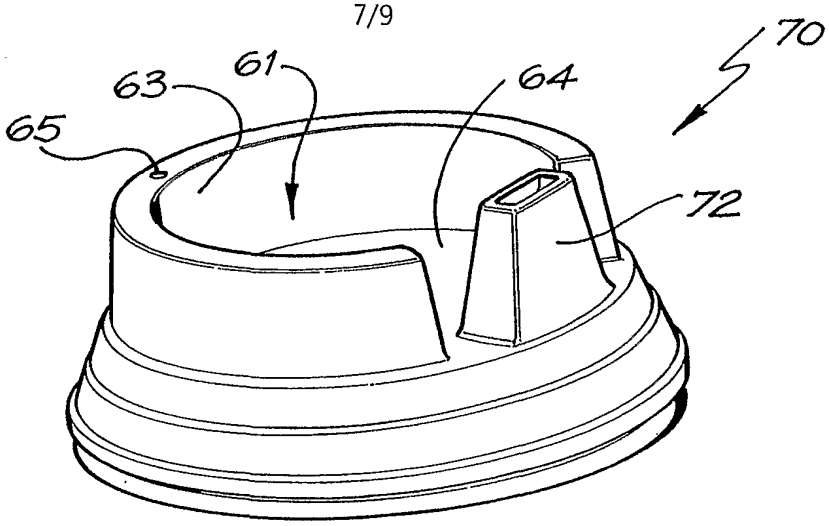

FIG. 12

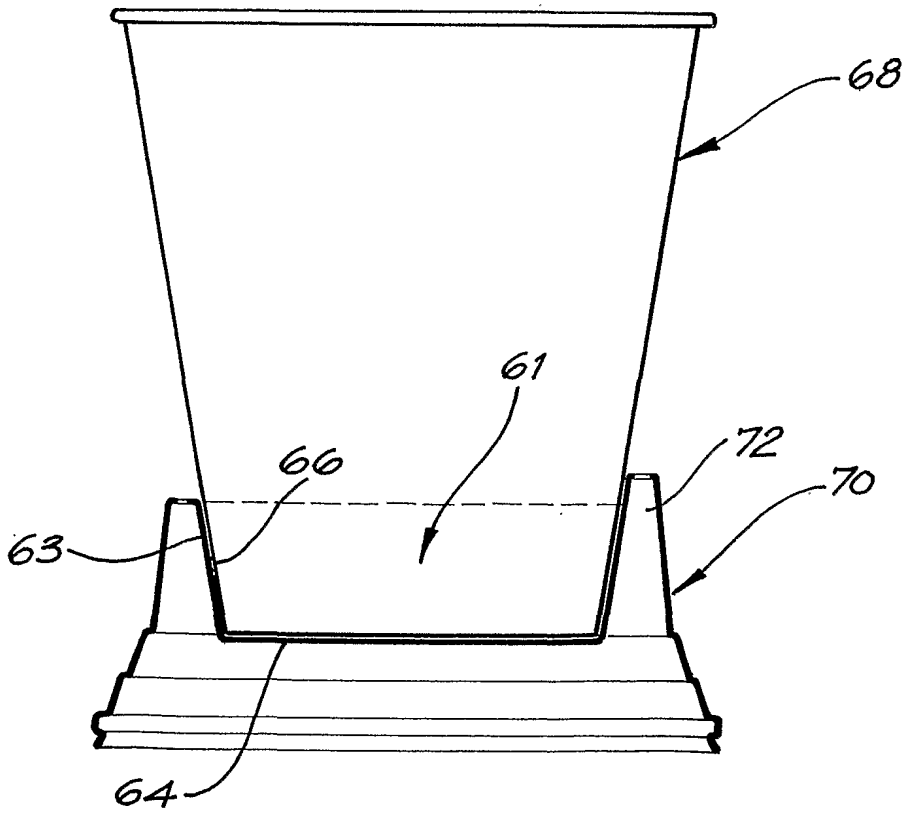

FIG. 13

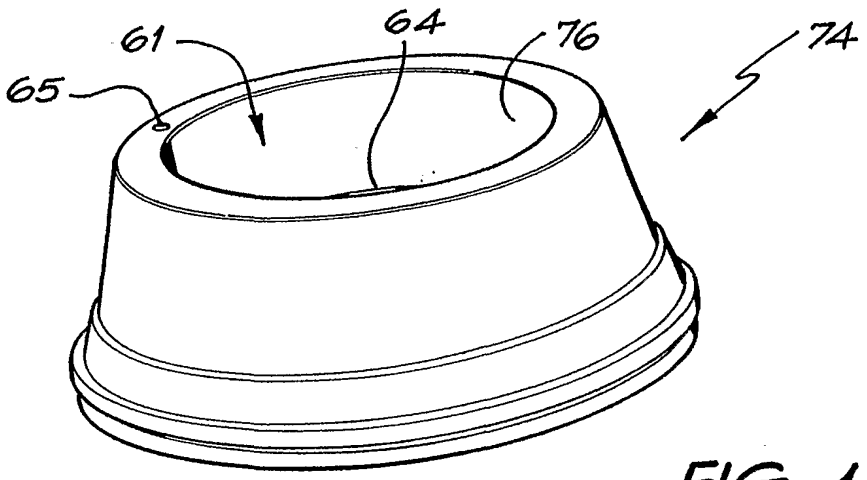

FIG. 14

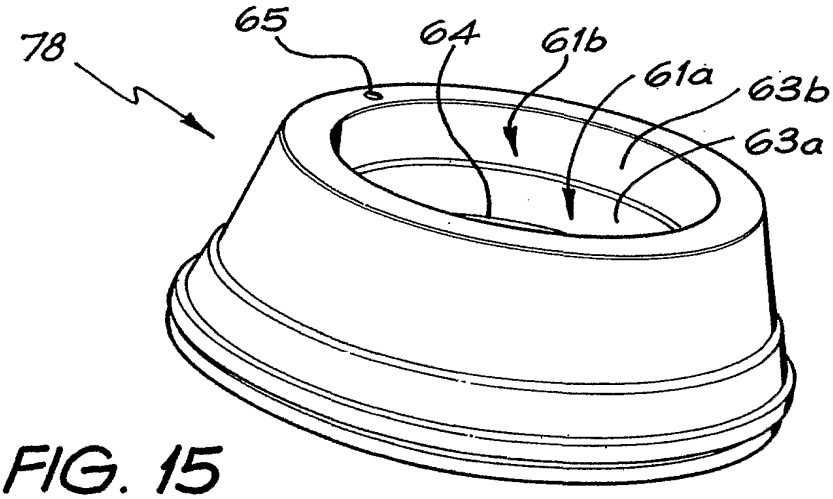

FIG. 15

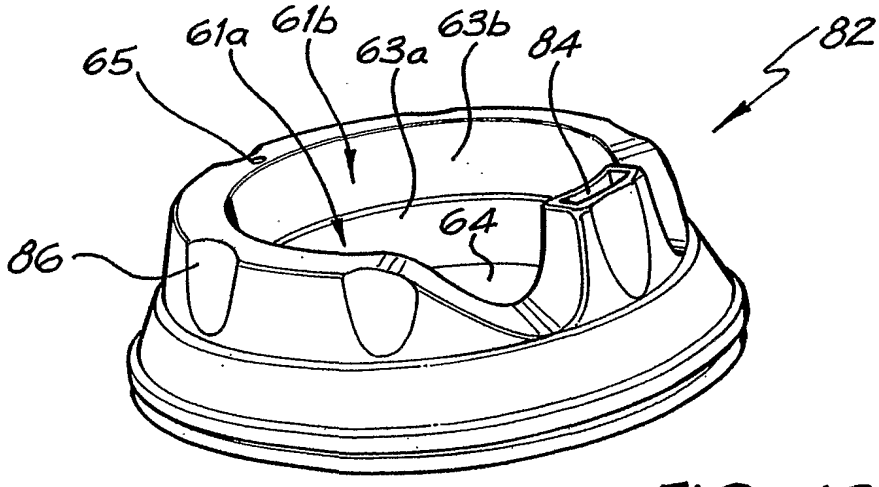

FIG. 16

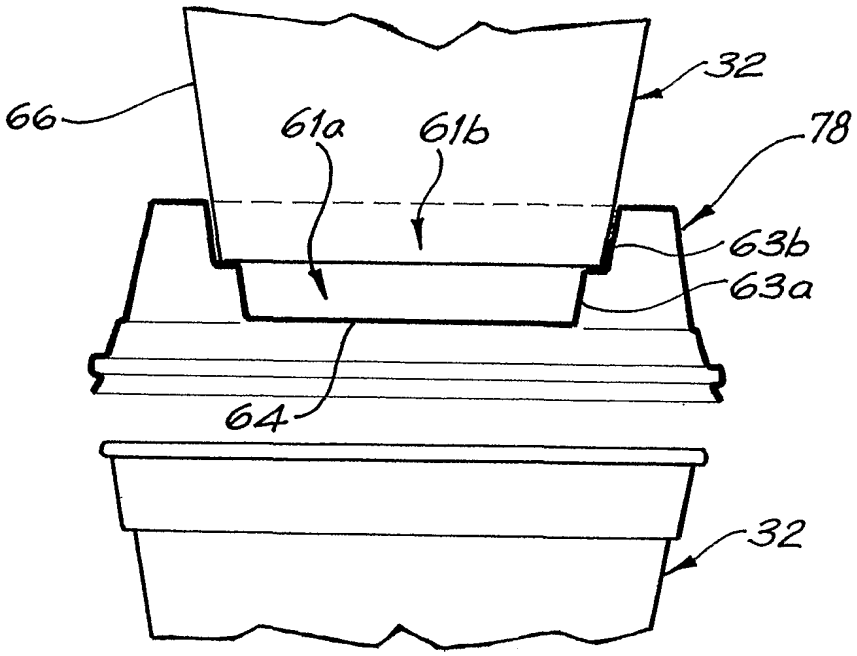
66
61a
61b
32
78
63b
63a
64
32

FIG. 17

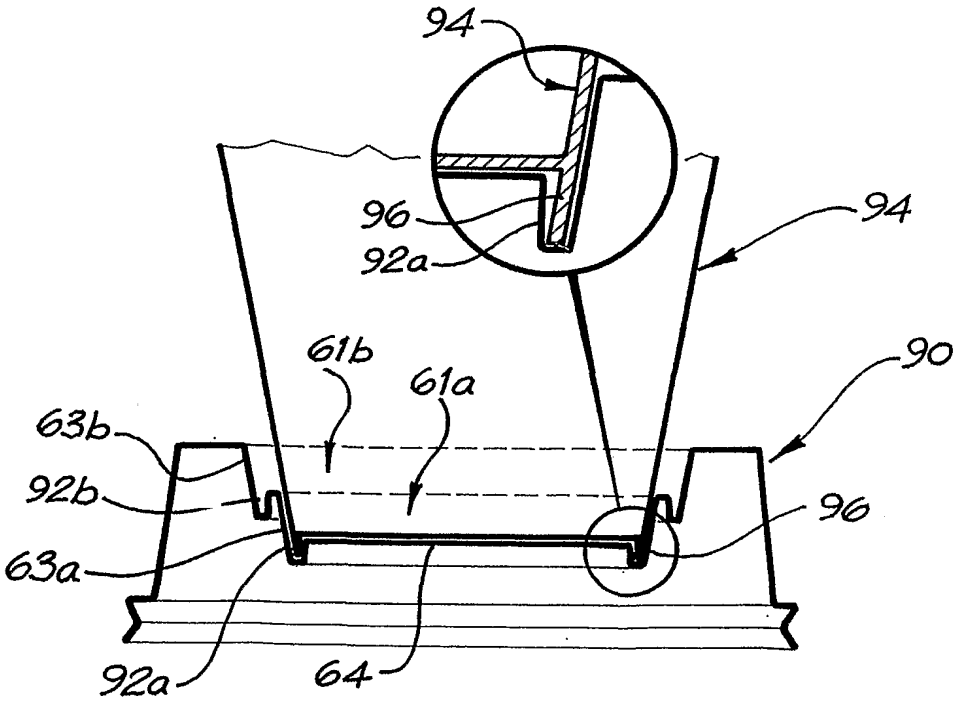
94
96
92a
94
61b
61a
90
63b
92b
96
63a
92a
64

FIG. 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/00029

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: B65D 81/18, G01K 11/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Refer to Electronic database consulted below

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI : IPC B65D 43/-, 81/18, G01K 1/20, 11/12, 13/00 and keywords (lid, closure, thermochromic, thermotropic, colour, heat, hot, temperature, cool, cold) and like terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5720555 A (ELELE) 24 February 1998 See entire document	1-17
X	GB 2316385 A (UNILEVER PLC) 25 February 1998 See entire document	1-17
X	US 4919983 A (FREMIN) 24 April 1990 Entire document	1-17

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 March 2002	22 MAR 2002
Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**A. ALI** Telephone No : (02) 6283 2607

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/00029

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97/27050 A (FOSTER MILLER INC.) 31 July 1997 See entire document	1-17
X	Derwent Abstract Accession No. 98-408034/35, Class D13, JP 10167342 A (YAJIMA) 23 June 1998 See abstract	1-17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/00029

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :

because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos :

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos :

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See attached sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-17

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/00029

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: II

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-17. These claims are directed towards solving the problem of gauging the actual temperature of the contents of a container. It is considered that the lid including at least a region having thermochromic properties which is/are adapted to change colour upon reaching a predetermined non-ambient temperature comprises a first "special technical feature".

2. Claims 18-31. These claims are directed towards solving the problem of safe conveyance of stacked containers with lids. It is considered that the lid including at least one recess having an internal side wall(s) that substantially correspond to the container external side wall(s) in size and shape so as to form a secure frictional engagement of the walls comprises a second "special technical feature".

Since the above-mentioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU02/00029

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member		
US 5720555	NONE		
GB 2316385	EP 837011		
US 4919983	NONE		
WO 97/27050	AU 18354/97	EP 885122	US 5843501
JP 10167342	NONE		

END OF ANNEX